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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/671,902	09/25/2003	Christopher E. Milliken	XX0163US.CIP (#90575)	8026

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D. PETER HOCHBERG CO. L.P.A.
1940 EAST 6TH STREET
CLEVELAND, OH 44114

EXAMINER	
ALEJANDRO, RAYMOND	

ART UNIT	PAPER NUMBER
1745	

DATE MAILED: 04/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/671,902	MILLIKEN ET AL.	
	Examiner	Art Unit	
	Raymond Alejandro	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 September 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *25 September 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Priority

1. This application constitutes a continuation-in-part of Application No. 09/992272, filed 11/14/01.

2. Acknowledgment is made of applicant's claim for domestic foreign priority under 35 U.S.C. 119(e). ***Drawings***

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: 102, 112. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

4. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "108" has been used to designate both the hollow cylindrical passage and the stack fuel manifold. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing

date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

5. The disclosure is objected to because of the following informalities: the current status of the non-provisional parent application must be updated (whether abandoned; or patented and its patent #). Appropriate correction is required.

6. The disclosure is objected to because of the following informalities: the specification in paragraph 0028 recites that Figure 2 shows adjacent cells 100 and 101, however, Figure 2 does not illustrate so. Appropriate correction is required.

Double Patenting

7. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned

with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

8. Claims 1-18 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-11 and 13-17 of U.S. Patent No. 6811913 in view of Isono et al 6365293.

US Patent'913 claims the following (CLAIMS 1-11 and 13-17):

1. An electrochemical system adapted to operate between a fuel cell mode, an electrolysis mode, and a mode alternating between said electrolysis mode and said fuel cell mode operating on a fuel gas mixture and an oxygen-containing gas mixture, said system comprising:

at least one hollow planar cell arranged to form an electrochemical stack, said stack including an electrical contact structure at each end of said stack;

an electronically conductive, substantially impervious, hollow planar separator for separating each cell from an adjacent cell within said stack and electrically connecting each cell to an adjacent cell;

a hollow planar, substantially impervious, electrolyte within each cell;

a hollow planar fuel electrode contacting said electrolyte, said electrode being on one side of the electrolyte;

a hollow planar oxygen electrode contacting said electrolyte and on the opposite side of electrolyte from said fuel electrode;

an electronically conductive fuel diffusion layer contacting said fuel electrode,

said fuel diffusion layer adapted to allow fuel and oxidized fuel transport via gaseous diffusion between the edge of said layer and said fuel electrode;

an electronically conductive oxygen diffusion layer contacting said oxygen electrode, said oxygen diffusion layer adapted to allow oxygen transport via gaseous diffusion between the edge of said layer and said oxygen electrode;

a first seal preventing said oxygen-containing gas mixture from accessing said fuel electrode and said fuel diffusion layer; and

a second seal preventing said fuel gas mixture from accessing said oxygen electrode and said oxygen diffusion layer.

2. An electrochemical system of claim 1 wherein said oxygen-containing gas mixture is substantially pure oxygen.

3. The electrochemical system of claim 1 wherein said oxygen electrode is operated on pure oxygen gas in either of said electrolysis mode or said alternating mode, said pure oxygen gas flowing within said oxygen diffusion layer due to a substantially slight pressure gradient.

4. The electrochemical system of claim 1 wherein said at least one cell has a shape selected from the group consisting of circular, square, rectangular and oval.

5. The electrochemical system of claim 1 wherein said fuel gas mixture comprises steam and hydrogen in each of said modes.

6. The electrochemical system of claim 1 wherein said at least one hollow planar cell is defined by at least one cavity.

7. The electrochemical system of claim 1 further including an additional electrical contact layer applied to at least one side of said separator to improve the electrical contact between the components of said at least one cell.

8. The electrochemical system of claim 7 wherein said additional electrical contact layer is ink comprising finely-divided electrode composition.

9. The electrochemical system of claim 1 further including at least one supplemental high temperature mass positioned adjacent to said stack and used in combination with said stack during a temperature rise for storing high temperature thermal energy released during said fuel cell mode for later release and during a temperature fall of electrolysis mode for reducing the electrical energy input for electrolysis.

10. The electrochemical system of claim 9 wherein said at least one supplemental mass is used to store during a temperature rise a portion of thermal energy released during cooling of a spent fuel stream from operation of said fuel cell mode for later use and during a temperature fall for helping heat said fuel gas mixture of said electrolysis mode to reduce the electrical energy input for electrolysis.

11. The electrochemical system of claim 1 wherein said fuel gas mixture flows past each cell substantially in succession thereby performing progressive reaction of said fuel gas mixture and enabling higher conversion efficiency.

13. The fuel cell system of claim 12 wherein said fuel gas mixture flows past each cell substantially in succession thereby performing progressive oxidation of said fuel gas mixture and enabling higher conversion efficiency.

14. A solid-oxide fuel cell system adapted to operate on a fuel gas mixture and an oxygen-containing gas mixture, said system comprising:

at least one hollow planar cell arranged to form a fuel cell stack, said stack including an electrical contact structure at each end of said stack;

an electronically conductive, substantially impervious, hollow planar separator for separating each cell from an adjacent cell within said stack and electrically connecting each cell to an adjacent cell;

a hollow planar, substantially impervious, electrolyte within each cell;

a hollow planar fuel electrode contacting said electrolyte on one side of said electrolyte;

a hollow planar oxygen electrode contacting said electrolyte and on the opposite side of electrolyte from said fuel electrode;

an electronically conductive fuel diffusion layer contacting said fuel electrode,

said fuel diffusion layer adapted to allow fuel and oxidized fuel transport via gaseous diffusion between the edge of said layer and said fuel electrode;

an electronically conductive oxygen diffusion layer contacting said oxygen electrode, said oxygen diffusion layer adapted to allow oxygen transport via gaseous diffusion from the edge of said layer to said oxygen electrode;

a first seal preventing said oxygen-containing gas mixture from accessing said fuel electrode and said fuel diffusion layer; and

a second seal preventing said fuel gas mixture from accessing said oxygen electrode and said oxygen diffusion layer.

15. The fuel cell system of claim **14** wherein said at least one cell has a shape selected from the group consisting of circular, square, rectangular and oval.

16. The fuel cell system of claim **14** further including an additional electrical contact layer applied to at least one side of said separator to improve, the electrical contact between the components of said at least one cell.

17. The fuel cell system of claim **16** wherein said additional electrical contact layer is ink comprising finely-divided electrode composition.

* * * * *

US Patent'913 discloses and claims a solid oxide system as described above. However, the US Patent'913 fails to disclose the specific tapered gas diffusion layer.

Isono et al disclose a fuel cell (TITLE) wherein the gas diffusivity is adjusted by changing the thickness of the gas diffusion layer. More specifically, the gas diffusivity is set relatively small by setting the thickness large in the entrance part. On the other hand, the gas diffusivity is set relatively large by setting the thickness small in the exit part (COL 2, lines 10-18).

In view of the above, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the specific tapered gas diffusion layer of Isono et al in the fuel cell system of the US Patent'913 as Isono et al disclose that the gas diffusivity is adjusted by changing the thickness of the gas diffusion layer. More specifically, the gas

diffusivity is set relatively small by setting the thickness large in the entrance part. On the other hand, the gas diffusivity is set relatively large by setting the thickness small in the exit part. Thus, Isono et al readily envision to progressively change the thickness of the gas diffusion layer for the benefit of adjusting gas diffusivity.

Moreover, Isono et al recognizes the thickness of the diffusion layer as a variable which achieves a recognized result, thus, the specific thickness (i.e. tapered gas diffusion layer) results from the characterization as routine experimentation of an optimum or workable range. Accordingly, the tapered (thickness) gas diffusion layer is being construed as a result-effective variable. In re Aller 105 USPQ 233, 235; In re Hoeschele 160 USPQ 809; In re Antonie 195 USPQ 6; In re Boesh 205 USPQ 215 (CCPA 1980). (MPEP 2144.05 II. Optimization of *Ranges)*.

In this regard, it is noted changes in shape (*i.e. tapered gas diffusion layer*) is a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed diffusion layer is significant. In re Dailey, 149 USPQ 47. It is also noted that aesthetic design changes having no mechanical function cannot be relied upon to patentably distinguish the claimed invention from the prior art. In re Seid , 73 USPQ 431.**(See MPEP 2144.04 [R-1] Legal Precedent as Source of Supporting Rationale).**

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

11. Claims 1, 3-4, 10, 12 and 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ruhl 4770955 in view of Isono et al 6365293.

As to claims 1, 10 and 16-18:

Ruhl discloses a solid electrolyte fuel cell and assembly (TITLE) wherein the electrolyte is yttria-stabilized zirconia (*solid oxide*) contacting the anode and the cathode (COL 1, lines 50-60). Fuel cell 1 includes two opposed separators 2 and 3 between which are disposed an anode 4, cathode 5, intervening electrolyte 6 and tubular gaskets 7 and 8 (*the sealing elements*) (COL 2, lines 47-60). Separators 2 and 3 contain first internal openings 9 and 10 (COL 3, lines 1-5); and second internal openings 12 and 13 (COL 3, lines 24-35). Gasket 8 forms part of the inside

surface of tube 14 (COL 3, lines 33-35) and tube 14 should be located close to tube 11 (COL 3, lines 35-40).

Ruhl specifically discloses the following (CLAIM 15):

15. A fuel cell assembly for oxidizing a fuel to produce electrical energy comprising:
a plurality of fuel cells electrically connected in series, said fuel cells comprising a gas-impervious plate-like separator including a first internal hole passing through said first separator for receiving a gaseous fuel;
a plate-like oxide powder cathode in contact with said separator and including a second internal hole passing through said cathode for receiving a gaseous fuel, said second hole being in at least partial registration with said first hole;
a plate-like, gas-impervious solid electrolyte in contact with said cathode and including a third internal hole passing through said electrolyte, said third hole being in at least partial registration with said first hole;
a substantially gas-impervious tubular gasket disposed within said second hole and sealingly contacting said electrolyte to protect said cathode from fuel within said first hole;
a plate-like powder anode in contact with said solid electrolyte and including a fourth internal hole passing through said anode, said fourth hole being in at least partial registration with said first hole;
a first end connection including an electrically conducting contact for establishing an electrical connection to a cathode of said plurality of fuel cells and a conduit in at least partial registration with said first hole for admitting a gaseous fuel thereto; and
a second end connection including an electrically conducting contact for establishing electrical connection to an anode in said plurality of fuel cells.

As to claim 3:

Ruhl discloses the use of oxygen (COL 1, lines 60-68).

As to claims 4 and 12:

Ruhl discloses planar fuel cells (See FIGURE 1 and 4).

Ruhl discloses a solid oxide fuel cell devices as described above. However, the preceding reference does not expressly disclose the specific tapered gas diffusion layer.

Isono et al disclose a fuel cell (TITLE) wherein the gas diffusivity is adjusted by changing the thickness of the gas diffusion layer. More specifically, the gas diffusivity is set relatively small by setting the thickness large in the entrance part. On the other hand, the gas diffusivity is set relatively large by setting the thickness small in the exit part (COL 2, lines 10-18).

In view of the above, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the specific tapered gas diffusion layer of Isono et al in the fuel cell system of Ruhl as Isono et al disclose that the gas diffusivity is adjusted by changing the thickness of the gas diffusion layer. More specifically, the gas diffusivity is set relatively small by setting the thickness large in the entrance part. On the other hand, the gas diffusivity is set relatively large by setting the thickness small in the exit part. Thus, Isono et al readily envision to progressively change the thickness of the gas diffusion layer for the benefit of adjusting gas diffusivity.

Moreover, Isono et al recognizes the thickness of the diffusion layer as a variable which achieves a recognized result, thus, the specific thickness (i.e. tapered gas diffusion layer) results from the characterization as routine experimentation of an optimum or workable range. Accordingly, the tapered (thickness) gas diffusion layer is being construed as a result-effective variable. In re Aller 105 USPQ 233, 235; In re Hoeschele 160 USPQ 809; In re Antonie 195 USPQ 6; In re Boesh 205 USPQ 215 (CCPA 1980). (MPEP 2144.05 II. Optimization of *Ranges)*.

In this regard, it is noted changes in shape (*i.e. tapered gas diffusion layer and cell shape*) is a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed diffusion layer and cell is significant. In re Dailey, 149 USPQ 47. It is also noted that aesthetic design changes having no mechanical function cannot be relied upon to patentably distinguish the claimed invention from the prior art. In re Seid , 73 USPQ 431.**(See MPEP 2144.04 [R-1] Legal Precedent as Source of Supporting Rationale)**.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Raymond Alejandro whose telephone number is (571) 272-1282. The examiner can normally be reached on Monday-Thursday (8:00 am - 6:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Raymond Alejandro

RAYMOND ALEJANDRO
PRIMARY EXAMINER

Primary Examiner
Art Unit 1745